



University of Pavia
Ph.D. School in Electronics, Computer Science and Electrical Engineering
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IEEE MTT-S Distinguished Microwave Lecturer (DML) Talk

Millimeter-Wave Integrated Circuit and Antenna-in-Package for Advanced Wireless System

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Zoom link: <https://us02web.zoom.us/j/87088393164>

Abstract: In the last decade, to meet the increasingly high requirements of wireless communications (including 5G/6G), radar, and the commercial field, millimeter-wave integrated circuits and antennas have experienced tremendous growth. With the rapid advancement of modern CMOS technology, it becomes a prevailing technology to achieve low-cost, highly-integrated radio-frequency and millimeter-wave integrated circuits. As the operating frequency enters the millimeter-wave regime, the conventional CMOS RFIC design approach based on the RLC lumped element model no longer effectively analyzes the circuit performance with satisfactory accuracy. Therefore, a mixed design methodology using both the lumped and distributed elements in the mmW-IC design is of great interest. Based on this method, various high-performance CMOS mmW-ICs can be implemented with novel low-loss EM structures using the distributed elements and compact-size lumped elements. Meanwhile, mmW-ICs using III-V semiconductor technologies outperform the CMOS counterparts in various aspects, and are preferably used in specific applications. Therefore, a heterogeneous integrated architecture with combined merits of both CMOS and III-V semiconductor mmW-ICs is an attractive alternative. On the other hand, considering the efficiency, cost, and integration of advanced wireless systems, discrete antenna is not suitable for millimeter-wave wireless systems anymore. Therefore, antenna-in-package (AiP) has become the mainstream of millimeter-wave antenna, which implements an antenna or antennas on (or in) an IC package that can carry a highly-integrated radio. In the talk, these new design methods and technologies on millimeter-wave integrated circuits, corresponding antenna-in-package, and the methodology of the millimeter-wave front-end system integration will be introduced.

Bio: Prof. Quan Xue (M'02–SM'04–F'11) received the B.S., M.S., and Ph.D. degrees in electronic engineering from the University of Electronic Science and Technology of China (UESTC), Chengdu, China, in 1988, 1991, and 1993, respectively. In 1993, he joined the UESTC as a Lecturer. He became a Professor in 1997. From October 1997 to October 1998, he was a Research Associate and then a Research Fellow with the Chinese University of Hong Kong. In 1999, he joined the City University of Hong Kong and was a Chair Professor of Microwave Engineering. He also served the University as the Associate Vice President, and the Director of Information and Communication Technology Center, and the Deputy Director of the State Key Lab of Millimeter Waves (Hong Kong). In 2017, he joined the South China University of Technology, where he is a Professor and serves as the dean of the School of Electronic and Information Engineering, the dean of the School of Microelectronics, and the Director of the Guangdong Key Laboratory of Terahertz and Millimeter Waves. He also serves as the a member of the National 6G Technology General Expert Group of China, and the Antenna Chief Scientist of Huawei Technologies 2012 Labs.

He has authored or co-authored over 500 internationally refereed journal papers and over 300 international conference papers. He is co-inventor of more than 20 granted Chinese patents and more than 30 granted US patents, 5 of which have been transferred. His research interests include microwave/millimeter-wave/THz passive components, active components, antenna, microwave monolithic integrated circuits (MMIC, radio frequency integrated circuits (RFIC). Professor Xue is a Fellow of IEEE and an IEEE distinguished microwave lecturer for the 2022-2024 term. He served the IEEE as an AdCom member of MTT-S (2011-2013) and the Associate Editor of IEEE Transactions on Microwave Theory and Techniques (2010-2013), the Editor of International Journal of Antennas and Propagation (2010-2013), the Associate Editor of IEEE Transactions on Industrial Electronics (2010-2015), the Associate Editor of IEEE Transactions on Antenna and Propagations (2016). Professor Xue is the recipient of the 2017 H. A. Wheeler Applications Prize Paper Award.

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